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PATENT APPLICATION

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IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Buswell et al.

Application No.: 10/061,492

Filing Date: 01-31-2002

Title: Methods and Systems for Forming Slots in a Semiconductor
Substrate Containing Microelectronics

Mail Stop Appeal Brief-Patents
Commissioner For Patents
PO Box 1450
Alexandria, VA 22313-1450

Confirmation No.: 2065

Examiner: Culbert, R.

Group Art Unit: 1763

TRANSMITTAL OF APPEAL BRIEF

Sir:

Transmitted herewith is the Appeal Brief in this application with respect to the Notice of Appeal filed on 11-05-2004.

The fee for filing this Appeal Brief is (37 CFR 1.17(c)) \$500.00.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

() (a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d) for the total number of months checked below:

- () one month
- () two months
- () three months
- () four months

() The extension fee has already been filled in this application.

(X) (b) Applicant believes that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

Please charge to Deposit Account 08-2025 the sum of 500.00. At any time during the pendency of this application, please charge any fees required or credit any over payment to Deposit Account 08-2025 pursuant to 37 CFR 1.25. Additionally please charge any fees to Deposit Account 08-2025 under 37 CFR 1.16 through 1.21 inclusive, and any other sections in Title 37 of the Code of Federal Regulations that may regulate fees. A duplicate copy of this sheet is enclosed.

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Rev 12/04 (Aplbrief)

Respectfully submitted,
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IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

Inventors: Buswell et al. **Examiner:** Culbert, R.
Serial No: 10/061,492 **Group Art Unit:** 1763
Filing Date: 1/31/02 **Confirmation No:** 2065
Title: Methods and Systems for Forming Slots in a Semiconductor
Substrate Containing Microelectronics

To: Commissioner of Patents and Trademarks
PO Box 1450
Alexandria, VA 22313-1450

From: Hewlett-Packard Development Company, L.P
Intellectual Property Administration
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Pursuant to 37 C.F.R. §41.37, Applicant/Appellant hereby submits an appeal brief for application 10/061,492, filed 1/31/02, within the requisite time from the date of filing the Notice of Appeal. Accordingly, Appellant appeals to the Board of Patent Appeals and Interferences seeking review of the Examiner's rejections.

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(1) Real Party in Interest

The real party in interest is Hewlett-Packard Development Corporation, the assignee of all right, title and interest in and to the subject invention.

(2) Related Appeals and Interferences

Appellant is not aware of any other appeals, interferences, or judicial proceedings which will directly affect, be directly affected by, or otherwise have a bearing on the Board's decision to this pending appeal.

(3) Status of Claims

Claims 43, and 46-48 stand rejected and are pending in this Application. Claims 43, and 46-48 are appealed. Claim 43 was previously amended. Claims 1-42, and 44-45 were previously canceled. Claims 43, and 46-48 are set forth in the Appendix of Appealed Claims on page 12.

(4) Status of Amendments

A Final Office Action was issued on 08/05/04.

A Response to the Final Office Action was filed on 10/05/04. Claims 46-48 were added as part of this Response.

An Advisory Action was issued on 11/03/04, indicating that the request for reconsideration had been considered but did not place the application in condition for allowance, but that for purposes of appeal claims 46-48 would be entered.

Appellant filed a Notice of Appeal on 11/05/04 in response to the Advisory Action and the Final Office Action.

(5) Summary of Claimed Subject Matter

A concise explanation of each of the independent claims is included in this Summary section, including specific reference characters. These specific reference characters are examples of particular elements of the drawings for certain embodiments of the claimed invention, and the claims are not limited to solely the elements corresponding to these reference characters.

With respect to independent claim 1, as discussed for example at page 8, line 13-21 and page 11, line 19 through page 14, line 7, a slot forming method makes a cut into a first surface (610) of a semiconductor substrate (606) using a cutting tool (800), wherein the cutting tool (800) has an axis of rotation (806) that is not perpendicular to the first surface (610). The method also removes material from a second surface (612) of the semiconductor substrate (606) effective to form, in combination with said cut, a slot (604a, best appreciated from Fig. 7) at least a portion of which passes entirely through the substrate (606), the slot (604a) being defined, at least in part, by first and second sidewalls (702a, 702b, best appreciated from Fig. 7) and first and second endwalls (704a, 704b best appreciated from Fig. 7) extending therebetween, and wherein said making forms a first portion (810, 812, best appreciated Fig. 8e) of the end walls (704a, 704b) and said removing forms a second portion (814, 816, best appreciated Fig. 8e) of the end walls (704a, 704b). In this instance the first and second portions (810, 814) of end wall (704a) meets at angle θ (Fig. 8e) greater

than or equal to ninety degrees relative to the substrate (606) and the first and second portions (812, 816) of end wall (704b) meets at angle δ (Fig. 8e) greater than or equal to ninety degrees relative to the substrate (606).

(6) Grounds of Rejection to be Reviewed on Appeal

Claims 43 and 46-48 stand rejected under §103 as being unpatentable over US Patent No. 4,746,935 to Allen, hereinafter referred to as “Allen” in view of US Patent No. 6,271,102 to Brouillette et al, hereinafter referred to as “Brouillette.”

(7) Argument

Rejection under 35 U.S.C. §103(a) over US Patent No. 4,746,935 to Allen in view of US Patent No. 6,271,102 to Brouillette.

Claim 43

Claim 43 is directed to a method of forming slots in a semiconductor substrate having first and second opposing surfaces comprising:

- making a cut into a first surface of a semiconductor substrate using a cutting tool, wherein the cutting tool has an axis of rotation that is not perpendicular to the first surface; and,
- removing material from a second surface of the semiconductor substrate effective to form, in combination with said cut, a slot at least a portion of which passes entirely through the substrate, the slot being defined, at least in part, by first and second sidewalls and

first and second endwalls extending therebetween, and wherein said making forms a first portion of the end walls and said removing forms a second portion of the end walls and wherein the first and second portions of each of the end walls meet at angle greater than or equal to ninety degrees relative to the substrate.

Appellant respectfully submits that Allen in view of Brouillette does not disclose or suggest removing material from a second surface of the semiconductor substrate effective to form, in combination with said cut, a slot at least a portion of which passes entirely through the substrate, the slot being defined, at least in part, by first and second sidewalls and first and second endwalls extending therebetween, and wherein said making forms a first portion of the end walls and said removing forms a second portion of the end walls and wherein the first and second portions of each of the end walls meet at angle greater than or equal to ninety degrees relative to the substrate as recited in claim 43.

(A). Lacking the present invention no motivation exists to combine the cited references.

Allen discloses that the “general purpose of this invention is to provide a new and improved thermal ink jet printer and method of operation which overcomes the aforescribed disadvantages of the prior art and consequently provides a print head of decreased drop generator design complexity”. (Col. 2, ll. 5-10). Allen further discloses that a “silicon substrate 30 includes a common ink feed-hole 32 in the form of a cylinder or slot through substrate 30 and configured using diamond saw blade or laser drilling techniques.” (Col. 3, ll. 45-

48). Allen does not suggest that there is a problem with this approach to forming slots or a need to improve it.

Brouillette discloses a “method and system for dicing a semiconductor wafer” (Brouillette, Abstract). Dicing involves separating a single component into multiple components and is distinct from slotting as dicing inherently does not create endwalls. As recited in claim 43 a slot passes through a substrate and the slot is defined by first and second sidewalls and first and second endwalls extending between the first and second sidewalls. Brouillette is totally silent as to such a feature as recited in claim 43.

At page 2 of the Final Office Action, the Examiner states that “Brouillette teaches an improved method for forming a slot through a silicon substrate.” Appellant respectfully disagrees that Brouillette has anything to do with slots or forming slots through a substrate. Claim 43 recites that a slot is a structure “at least a portion of which passes entirely through the substrate” and further that the slot is “defined, at least in part, by first and second sidewalls and first and second endwalls extending therebetween”. Dicing, as disclosed in Brouillette, divides a “wafer into dies.” (Col. 3, ll. 20-22). As such, Brouillette does not relate to forming a slot or other feature within a substrate, instead Brouillette divides a single substrate into multiple pieces, and is not in the same field of endeavor as either the claimed subject matter or Allen.

The Office responds that “the dicing process of Brouillette clearly forms a slot through a substrate. A “slot” is simply a narrow opening or groove.” (Final Office Action, page 2). Appellant respectfully disagrees. Claim 43 expressly defines a slot in the context of the claim. The claim language itself is clear in

limiting the claimed slot. As such there is no need for an external definition. Further, the Office defines “slot” as “simply a narrow opening or groove”, but this adds nothing to furthering prosecution since the terms ‘narrow opening’ and ‘groove’ are not defined, whereas what is meant by the term ‘slot’ is defined within claim 43. Brouillette does not describe such a feature.

The Office contends that motivation exists to combine the references because “Brouillette discloses that “chips flexed in bending such that the active face and diced edges are placed in tension show large strengths with little variability while those flexed such that the non-active face and diced edges are placed in tension show small strengths with large variability.”” (Advisory Action page 2).

The Office has provided no citation from Allen that edge variability problems or substrate strength problems have been encountered with the common ink feed-hole 32 in the form of a cylinder or slot through substrate 30” as described by Allen. (Col. 3, ll. 45-48). Lacking any evidence that such factors are problematic for Allen’s print cartridge there is no motivation to apply teachings from Brouillette’s dicing techniques to Allen’s print cartridge formation techniques. Further, Allen describes his invention as providing a “print head of decreased drop generator design complexity and characterized by an extended lifetime”. (Allen, Col. 2 lines 5-10). Thus Allen teaches directly away from any motivation for the skilled artisan to go research other slot forming techniques. To the contrary Allen teaches that his “print head...[is] characterized by an extended lifetime”. Thus Allen contains no motivation for the skilled

artisan to examine Brouillette and instead teaches directly away from any such suggestion.

The Office further contends that motivation exists to combine the references since “Brouillette further teaches that entrance cuts are stronger and cleaner than exit cuts. (Brouillette, Col. 6. lines 15-20) and that strong clean edges are formed with the option of beveled or stepped cuts. Brouillette also teaches that scatter in cutting damage and strength are also diminished for the entrance cuts. Appellant has not addressed these clear advantages which are old and well known in the art of cutting with a saw blade.” (Advisory Action page 2). Appellant again returns to the art of record.

Allen is totally silent as to any shortcomings as to the techniques used to form the slot (common ink feed hole) within the substrate, or problems with the resultant substrate having the slot formed therein. To the contrary, Allen describes his invention as providing a “print head of decreased drop generator design complexity and characterized by an extended lifetime”. (Allen, Col. 2 lines 5-10). Brouillette is silent as to forming a feature within a substrate. Lacking a hint from Allen of potential print head failures, one of skilled in the art would have no reason to go investigate Brouillette’s dicing art. Further still the Office provides no evidence as to a likelihood of success for the Office’s proposed combination. The record contains no evidence that Brouillette’s “beveled or stepped cuts” would be successful or desirable in close proximity to Allen’s volume ink channels 40, 42, 44. See Col. 3 lines 45-55. Lacking such likelihood of success one of skill in the art, for this additional reason, would not be motivated to combine the references.

(B). Even considering arguendo that motivation exists for combining Allen and Brouillette, the art of record still does not teach or disclose the limitations of claim 43.

Claim 43 is directed to a method of forming slots in a semiconductor substrate having first and second opposing surfaces. The method includes removing material from a second surface of the semiconductor substrate effective to form, in combination with said cut, a slot at least a portion of which passes entirely through the substrate. The slot being defined, at least in part, by first and second sidewalls and first and second endwalls extending therebetween and wherein said making forms a first portion of the end walls and said removing forms a second portion of the end walls and wherein the first and second portions of each of the end walls meet at angle greater than or equal to ninety degrees relative to the substrate. Allen is silent as to such a slot configuration.

However, considering arguendo that Allen teaches a slot having first and second sidewalls and first and second endwalls extending therebetween, Allen does not describe, teach or suggest a slot where first and second portions of each of the end walls meet at angle greater than or equal to ninety degrees relative to the substrate. Allen is totally silent as to such a limitation. Brouillette is equally silent. Appellant has examined Brouillette and found no such feature. The Office has been equally unable to provide a citation to such a feature. As such, the art of record fails to teach or suggest the limitations of claim 38.


Claims 46-48 depend from claim 43 and are allowable for at least the same reason as claim 43.

Conclusion

The Office's basis and supporting rationale for the § 103(a) rejections is not supported by the teaching of the cited references. Appellant respectfully requests that the rejections be overturned and that pending claims 43 and 46-48 be allowed to issue.

Respectfully Submitted,

Dated: 1/05/05

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(8) Appendix of Appealed Claims

43. A method of forming slots in a semiconductor substrate having first and second opposing surfaces comprising:

making a cut into a first surface of a semiconductor substrate using a cutting tool, wherein the cutting tool has an axis of rotation that is not perpendicular to the first surface; and,

removing material from a second surface of the semiconductor substrate effective to form, in combination with said cut, a slot at least a portion of which passes entirely through the substrate, the slot being defined, at least in part, by first and second sidewalls and first and second endwalls extending therebetween, and wherein said making forms a first portion of the end walls and said removing forms a second portion of the end walls and wherein the first and second portions of each of the end walls meet at angle greater than or equal to ninety degrees relative to the substrate.

46. The method of claim 43, wherein the cutting tool comprises a circular saw.

47. The method of claim 46, wherein the act of making a cut comprises making multiple cuts into the first surface with the circular saw.

48. The method of claim 43, wherein said removing comprises one or more of: sand drilling, dry etching, wet etching, and drilling with a rotary drill bit.